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Fermilab Friends' graphics incorporate an image of one of Robert Wilson's best known sculptures, Möbius Strip. Slicing a Möbius strip lengthwise results in two interlinked loops, an appropriate metaphor for the relationship between FFSE and the Fermilab Office of Education and Public Outreach: separate, yet tightly linked.



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Nigel S. Lockyer
Director of Fermilab

A handwritten signature in blue ink, reading "N S Lockyer", written in a cursive style.

Dear Fermilab Friends for Science Education,

Thank you for your support of STEM education. The new administration in Washington and the Department of Energy have emphasized the importance of STEM. The opportunity to impact young lives, even one, is worth all your efforts. The Lederman Science Center is a model of success for which the Fermilab community is proud. I am always proud of the fact that Fermilab has this extra dimension to its program beyond scientific research. Many dedicated people from the community and from Fermilab contribute to these events. Thank you on behalf of our community neighbors.

Congressman Randy Hultgren recently brought a group of high school students to the Lederman Science Center on a rainy weekend and once again, your team made it a success. As we celebrate our past 50 years of discovery and success this year, I hope you all will begin to think about the next 50 years. Your mission to educate and excite the young burgeoning scientific minds will be central to our health as a laboratory, community, state, and nation.

Fermilab and the entire Fermilab community is proud of what you do. Thank you.

FROM THE FFSE PRESIDENT

Dear Friends,

As 2016 progressed, we realized that a new future was unfolding for the partnership of Fermilab Friends for Science Education. We have anniversaries to recognize and new colleagues in the Fermilab Office of Education and Public Outreach to work with in the coming years.

In 2016, we began the process of converting our membership records and communication to a new system. We continued to offer, in collaboration with the Fermilab Office of Education and Public Outreach, the popular programs of the Family Open House, Outdoor Family Fair and STEM Career Expo. We supported our Fermilab volunteers through the Director's Volunteer Reception and Award. FFSE made it possible for high schools in Kane and DuPage Counties to recognize exemplary high school science students through the student award. With the support of our generous members, we offered program scholarships for teachers and families. Thank you to our members and anonymous donor for continuing support to accomplish these offerings.

Several anniversaries are upon us in 2017. Fermilab celebrates 50 years! The Wonders of Science, established as a program under Fermilab Friends for Science Education, is celebrating 30 years. The STEM Career Expo, supported by FFSE and area schools, has its 10th anniversary, programs and efforts that touched thousands of people.

Yet, these efforts—Fermilab's phenomenal scientific history, the Wonders of Science and the STEM Career Expo—would not have become a reality without their leaders' vision, inspiration and hard work. While bittersweet, we held a tribute to Helen Edwards' contributions in 2016. It was wonderful to have FFSE member and Director Emeritus John Peoples in attendance. We continue to celebrate the 50th anniversary of Fermilab throughout the year. We hope you will join us in the many opportunities to celebrate. At our annual meeting, we will recognize the visionaries of the Wonders of Science, including Lee Marek and those members of Weird Science—Lee, Bill Grosser and Karl Craddock—who keep inspiring young students, year after year. We remember educators Sue Gloss and Jane Harris, ten years ago, from St. Charles and Geneva High Schools, who approached us to work with them to host the first STEM Career Expo.

Entering 2017, we have the new Fermilab Friends for Science Education CRADA in place. We have new leadership in the Fermilab Office of Education and Public Outreach: Spencer Pasero as manager; and Amanda Early and Maureen Hix as new program leaders. We are happy to have Shelly Helms and Lori Haseltine as program registrars, all energizing people to work with through the next years.

With your continued interest, participation and support, we can continue to connect the outstanding resources of Fermilab with the public, teachers and students to be engaged in STEM for the next 10, 30 and 50 years ahead. Stay tuned!



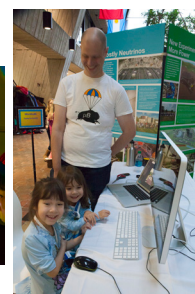
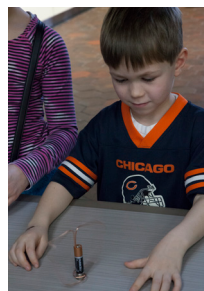
Susan M. Dahl
President, Fermilab Friends for Science Education

A handwritten signature in blue ink that reads "Susan Marie Dahl".

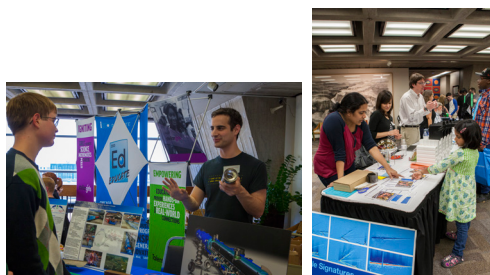
PROGRAMS IN 2016

FERMILAB FAMILY OPEN HOUSE

The 12th Annual Fermilab Family Open House was held on Sunday, January 31, 2016. Co-sponsored by the Fermilab Education Office and Fermilab Friends for Science Education, an estimated 3,500 people participated in this fun-filled event. Activities for the whole family from hands-on science exhibits to tours of some of the lab's attractions fascinated this record crowd. Jerry Zimmerman as "Mr. Freeze," a "physics carnival" including interactive exhibits by students from area high schools, and Cosmic Shuffleboard which explored the concept of dark matter proved exciting and educational. Scientists in the new operations center answered questions and a panel of lab employees presented an interactive talk about their day-to-day jobs. Two special tours were offered: one to see the 50-foot-wide Muon g-2 electromagnet that was transported from New York in 2013, and one to visit a laboratory where parts of our neutrino beam production devices are created. The Family Open House is free to the public and is made possible by an anonymous donor to FFSE.



STEM CAREER EXPO



What does a scientist actually do all day? How difficult is it to be a mechanical engineer? What jobs could I get if I major in mathematics? What is the daily life of a computer technician really like? On Wednesday, April 20, approximately 800 high school students engaged in an opportunity to ask those questions in person. The annual Science, Technology, Engineering and Mathematics (STEM) Career Expo was held in the atrium of Wilson Hall. The expo put those students face to face with people actually doing the jobs for which they will be applying for in the future. In addition to Fermilab scientists and engineers, the STEM Career Expo featured professionals from many Chicago-area organizations.

The STEM Career Expo is free and open to all high school students. The event is a collaborative event organized by the Fermilab Education Office and educators/career specialists from Kane, DuPage and Kendall County schools. Sponsors include Fermilab Friends for Science Education, Batavia High School, Geneva Community High School, Yorkville High School and Valley Education for Employment System.

OUTDOOR FAMILY FAIR

Approximately 550 children and adults enjoyed perfect weather on June 12, 2016, as they participated in a day of outdoor adventure and learning. With the assistance of 20 docents and 3 staff members, visitors learned about natural science and had loads of fun as they sang along with the Earthsinger; learned about chimney swifts, hawks, and falcons; saw sunspots through a telescope; and ran like a proton. They enjoyed opportunities to engage in a prairie scavenger hunt, sweep for insects and meet a local raptor trainer. Participants also compared themselves to bison, netted for pond critters, visited the bison herd. A glorious time was had by all in the prairie, by the pond and around the Lederman Science Education Center.



CONGRATULATIONS TO HONOREES!

DIRECTOR'S AWARD FOR EXCEPTIONAL VOLUNTEER SERVICE

The Fermilab Education Office relies on volunteers from many areas to serve as advisers, instructors, mentors and role models for future scientists and world citizens. They visit classrooms, participate in career nights, help design and maintain Lederman Science Center exhibits, contribute program expertise and so much more. Fermilab Friends for Science Education is proud to support this award with funds from an anonymous donor.

The 2016 winner was scientist **Brian Nord**, who was honored for his exceptional contributions to the laboratory's education programs on November 7, 2016. Nine others at the lab were also recognized for their contributions to K-12 programs, including physics presentations at schools and libraries, student field trips to Fermilab and tours of the experimental areas. This year's nominees were **Penelope Constanta, Andrew Dalesandro, Dee Hahn, Cindy Joe, Alyssa Miller, Chris Olsen, Jamie Santucci, Marc Weinberg** and **Jerry Zimmerman**. The selection committee included: Dee Hahn, Curtis Danner and Mike Albrow (committee chairman).

A talented communicator, Brian studies dark matter, but takes time to mentor high school students and teachers in physics. He also speaks with college students who visit the laboratory. Brian is very active in public outreach and has given Ask-a-Scientist lectures, talked at the Family Open House, performed in the Fermilab Physics Slam and given tours for Saturday Morning Physics. His passion for outreach stems from a desire to empower people to better understand the world around them.

"A science-literate population benefits everyone," Brian says. "At its core, science is about people—either the people that science serves or the people who make the science happen. Beyond its focus on people, science is about justice," he said. "Science literacy provides a mechanism for individuals and societies to make choices that uphold justice and fairness in our communities."



PROGRAM SCHOLARSHIPS

FFSE scholarships provide assistance for teachers, students and families in their quest for STEM experiences. Applications open in late fall and close March 1, 2016. In 2016, **7** teachers received scholarships for teacher workshops: **Beth Bierlein**, Particles and Prairies; **Amanda Birth**, Particles and Prairies; **Catherine Evans**, Particles and Prairies; **Daria Hankewych**, Prairie - Our Heartland; **Sonya Karl**, Phriendly Physics; **Diane Oosthuizen**, Insects at Work in Our World; and **Alison Zeller**, Prairie - Our Heartland. Additionally, **1** Prairie - Our Heartland field trip received assistance for bus transportation to Fermilab and **6** families received scholarships enabling children to attend Science Adventures at Fermilab.

FERMILAB SCIENCE AWARD FOR HIGH SCHOOL STUDENTS

Every year FFSE underwrites an award program for outstanding science students attending high schools in DuPage and Kane Counties. Nominated by school faculty, each winner receives a certificate and a book at their school's award ceremony.

This year's winners were:

Natael Avila, **Sophia Belvedere**, Addison Trail High School; **Scott Becker**, **Annabel Engelhardt**, Aurora Central Catholic High School; **Brian Helfrecht**, **Hannah Ullberg**, Batavia High School; **Brittany Mankowski**, **Jeffrey Marek**, Benet Academy; **Steven Tammes**, **Jared Trupp**, Central High School; **Zachary Scheffel**, **James Weiss**, Downers Grove South High School; **Amber Rose Janiszewski**, **Andrew Michael Vogler**, Dundee-Crown High School; **Venus Apantenco**, **Deshaun Laughlin**, East Aurora High School; **David Hill**, **Joe Ott**, The Einstein Academy; **Emma May**, **Sarah Summers**, Elgin Academy; **Stephen Creger**, **Michael Wilkins**, Geneva High School; **Nathan Chalus**, **Joseph Rexroad**, Glenbard North High School; **Masooma Haider**, **Andrew Pen**, Glenbard South High School; **Claire Baxter**, **Anthony Oleksy**, Hampshire High School; **Ankush Bajaj**, **Sophie Lekas**, Hinsdale Central High School; **Aidan Kelly**, **Joseph O'Shea**, Hinsdale South High School; **Kyven Lee**, **Sabrina Vorne**, IC Catholic Prep; **William Drenna**, **Lydia Stone**, Illinois Mathematics and Science Academy; **Rana Salem**, **Samer Wahood**,

Islamic Foundation School; **Savanna Chimenti**, **Quentin Smith**, Kaneland High School; **Emily Joyce**, **Josh Solarz**, Lake Park High School (East Campus); **Sarah El Rahmany**, **Ben Long**, Larkin High School; **Jessica Metelski**, **Samuel Tarasewicz**, Lisle High School; **Mary Larson**, **Brandon Sakas**, Montini Catholic High School; **John Laboe**, **Lucy Wang**, Naperville Central High School; **Erin Burrell**, **Nicholas Russo**, Neuqua Valley High School; **Isabella Duarte**, **Grace Wenner**, Rosary High School; **Meagan Gramatikov**, **Kelvin Wang**, St. Charles East High School; **Bailey Ricketts**, **Archan Vyas**, St. Charles North High School; **Andrew Szweczyk**, **Annika Zdon**, St. Francis High School; **William Cohen**, Waubesa Valley High School; **Leah Rachow**, **Ethan Wahl**, West Aurora High School; **Nayeli Lara**, **Rahul Prabhu**, West Chicago Community High School; **Rediat Ephrem**, **Markus Grasemann**, Westminster Christian School; **Matthew Bianco**, **Sara Korajkic**, Wheaton Academy; **Maciej Mleczko**, **Thomas Tedeschi**, Wheaton Warrenville South High School; **Jillian Dunbar**, **Brandon Parr**, York Community High School.



THE YEAR AT A GLANCE: CELEBRATING SUCCESS THROUGH THE SEASONS

WINTER

- 12th Annual Fermilab Open House on January 31 (See mini-story.)
- FFSE Members tour to Fermilab Accelerator Science and Technology (FAST) Facility and the Integrable Optics Test Accelerator (IOTA) ring on December 10 (See mini-story.)
- Planning intensified for FFSE-supported spring and summer programs

SPRING

- FFSE selected recipients for teacher workshop, Science Adventure and transportation scholarships. **7** scholarships were awarded.
- STEM Career Expo on April 20 (See mini-story.)
- FFSE Annual Meeting on May 17
- Fermilab High School Science Awards presented to promising science scholars in DuPage and Kane Counties (See list of recipients on page 7.)

SUMMER

- Fermilab Outdoor Family Fair on June 12 (See mini-story.)
- FFSE board members and friends met summer teacher workshop participants and supplied snacks to raise awareness and promote membership in FFSE.
- Fall field trip and classroom visit activities were readied.

FALL

- FFSE van took scientists and physics equipment for classroom presentations that continue throughout the school year.
- FFSE Program Scholarship applications opened on November 1.
- Volunteer Reception and Director's Award was presented on November 7. (See mini-story.)
- Regular board meeting on November 15.

FFSE SUPPORTS EDUCATION PROGRAMS AND OUTREACH EFFORTS DIRECTLY AND IN COLLABORATION WITH OTHERS THROUGHOUT THE YEAR.

PHYSICS AND PRAIRIE FIELD TRIPS

1,574 middle school students from 31 schools participated in 40 field trips for the Beauty and Charm and Phriendly Physics programs.

3,308 students traveled to Fermilab's prairie:

- 210 students from 3 schools for High School Life Science
- 244 students from 5 schools for Insects at Work in Our World (early elementary)
- 538 students from 9 schools for Prairie – Our Heartland (late elementary)
- 2,316 students from 19 schools for Particles and Prairies (middle level)

SUMMER TEACHER PROGRAMS

58 teachers and docents participated in 7 workshops including:

- Mechanics
- Electricity and Magnetism
- Beauty and Charm
- Particles and Prairies
- Insects at Work in Our World
- Phrendly Physics
- Prairie - Our Heartland

SCOUTS

1,297 scouts from 81 troops participated in 42 badge programs.

SCIENCE ADVENTURES


567 children participated in 49 adventures including: Junior Prairie Rangers; Lego Engineering; Nanotech Investigations; Snow Crystals; Kid Inventors; Flutter Like a Butterfly; Fireflies, Sea Monsters and Glow Sticks; The Bugs are Back; Chemistry at Your Fingertips; Wild and Wonderful Weather; Friction Unleashed; Club Invention; Hands-on Engineering; Design and Create: Be an Engineer; Earth Engineers; Caring for Critters; Survival Science; Dynamic Duo; Making Waves with Medical Imagery; Traveling the Universe; Dinosaur Hunt; Nature's Power Lab; Games, Magic and the Brain; Unlocking Science and Math Problems; Crystal Connections; Wondering Why? Magnetic Magic; What Makes You So Special? Playing with Your Food; CSI: Careful Scientific Investigation; Spiders: Spinners of Silk; Code Cracking, Cryptograms and Other Mysteries.

CLASSROOM PRESENTATIONS

24,965 students enjoyed 155 presentations in 97 locations.

- Charge! Electricity and Magnetism
- Forces and Motion, Space
- Time and Universe
- Light and Color
- Physics of Sports
- Physics in the Real World (career talk)
- Cryogenics Show

Additionally, scientists contributed to career events/career tables in 5 locations, serving 713 individuals.



PERSONNEL

THE SUCCESS OF THE 2016 FFSE EDUCATION PROGRAMS RESTS WITH THESE OUTSTANDING PROGRAM LEADERS.

Michael Bachrodt, Fremd High School, Palatine • **James Browne**, Amboy High School • **Sue-z Bruno**, Gates Elementary School, Aurora
Jill Burke, Franklin Park School District 84 • **Trudi Coutts**, Naperville Community Unit School District 203 • **James D. Cox**, teacher, retired • **Karl Craddock**, Fremd High School, Palatine • **Larry Cwik**, Seton Academy, South Holland • **Jason English**, Fremd High School, Palatine • **Todd Ernst**, Valley View School District 365U • **Michelle Fabian**, Batavia High School • **Patricia M. Franzen**, Germantown Hills
Barbara Greenberg, teacher, retired • **Bill Grosser**, Oak Park and River Forest High School • **Milton Harris**, Clarendon Hills Middle School • **Mary Ann Janiak**, teacher, retired • **Randy Jones**, Glen Ellyn School District 41 • **Elizabeth Karnik**, Western Springs School District 101 • **Steve Keefe**, teacher, retired • **Nicole Kitzmiller**, Rotolo Middle School, Batavia • **Mike Knapp**, Marquardt Middle School • **Tom Knutson**, teacher, retired • **Ellen Kohlmeir**, biomedical scientist • **Lee R. Marek**, North Central College, Naperville
Amy Miller, Johnson Elementary School, Warrenville • **Maureen Mitchell**, Geneva High School • **Stefany Montgomery**, Larkin High School, Elgin • **Jill Mueller**, West Chicago Middle School • **Radomir Niewrzol**, Glenbard North High School, Carol Stream • **Mary Sue Offut**, SciTech and Field Museum volunteer • **Glenda Peck**, teacher, retired • **Chris Ruffolo**, Neuqua Valley High School, Naperville
Susan Sanders, Glenbard School District 87, Glen Ellyn • **Katherine Seguino**, Naperville Central High School • **Marsha Stierwalt**, Alice Gustafson Elementary School, Batavia • **Patrick Swanson**, Hoffman Estates High School • **Dave Torpe**, James B. Conant High School, Hoffman Estates • **Karen Weigt**, Kaneland John Stewart Elementary School, Elburn • **Wayne R. Wittenberg**, Benjamin Franklin School, Glen Ellyn

MANY FERMILAB SCIENTISTS GIVE THEIR TIME GENEROUSLY TO EDUCATION PROGRAMS THROUGHOUT THE YEAR.

Corey Adams • Mark Adams • Michael Albrow • Gerard Altayo • Wayne Baisley • Maurice Ball • Dennis Barak • Whitney Begner • Leo Bellantoni • Jamie Blowers • Gino Bolla • Mark Bollinger • Rodger Bossert • Dan Brommelsiek • Chuck Brown • Ryan Campbell • Kermit Carlson • Tom Carter • Brendan Casey • Alex Chen • Guram Chlachidze • Dave Christian • Penelope Constanta • Lance Cooley • Tom Croc • Andrew Dalesandro • Fritz DeJongh • Roger Dixon • Brian Drendel • Chip Edstrom • Juan Estrada • Martin Frank • Patrick Fox • Bill Freeman • Peter Garbincius • Lynn Garren • Sandra Geib-Ingram • Lisa Giacchetti • Camille Ginsburg • George Ginther • Doug Glenzinski • Sowjanya Gollapinni • Stefan Gruenendahl • Dee Hahn • Steve Hahn • Sten Hansen • David Harding • Elvin Harms • Anne Heavey • Marie Herman • Michael Herr • Samantha Kaushalya Hewamanage • Jim Hirschauer • Jeremiah Holzbauer • Julie Hogan • Sergo Jindariani • Cindy Joe • David Johnson • Todd Johnson • Clementine Jones • Soon Yung Jun • Jim Kalina • Brendan Kiburg • Young-Kee Kim • Bonnie King • Terry Kiper • Mike Kirby • Donna Kubik • Arthur Lee • Bill Lee • Jerry Liebfritz • Don Lincoln • Sarah Lockwitz • Marco Mambelli • Margaret Marks • Chris Marshall • Carrie McGivern • Petra Merkel • Don Mitchell • Denton Morris • Matthew Muetther • Duane Newhart • Dennis Nicklaus • Tom Nicol • Brian Nord • Chris Olsen • Jesus Orduna • Chong Shik Park • Anna Pla-Dalmau • Ruth Pordes • Sam Posen • Chris Quigg • Jen Raaf • Erik Ramberg • Paul Reimer • Kurt Riesselmann • Rob Roser • Josh Rubin • Jason St. John • Jamie Santucci • Niki Saoulidou • Peter Shanahan • Aria Soha • Chris Stoughton • Gary Teafoe • Marcia Teckenbrock • Linda Valerio • Rod Walton • Marc Weinbert • Mike Weis • Jeremy Werner • Will Wester • Chris White • Tammy Whited • Herman White • Meiqin Xiao • Jim Zagel • Sam Zeller • Jerry K. Zimmerman • Bob Zwaska

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DOCENTS FACILITATE STUDENT FIELD TRIPS AND OTHER EDUCATION OFFICE ACTIVITIES AND SUPERVISE THE LEDERMAN SCIENCE CENTER.

Julie Albert • Donna Blankenship • Mary Campbell • Muriel Cease • Janet Chaterji • Susan Dumford • Vida Goldstein • Jane Gravelle • Lori Haseltine • Helen D. Huie • Jacqueline J. Krock • Nancy Lanning • Toni Mueller • Mary Jo Murphy • Paula Mytych • Dave Orleans • Gail Poisson • Bob Shaw • Adele Southcott • Sue Styer • Felicia Svoboda • Anne Mary Teichert • Yvonne Twomey • Vicki Williams • Dorothy Yurs

REVENUES AND EXPENSES

	2016 (audited)	2015 (audited)
Revenues (\$000)		
Contributions/Foundations	\$ 24.6	\$ 28.1
Membership	12.8	12.5
Other	4.9	5.4
Total Revenue	\$ 42.3	\$ 46.0
Expenses		
Program Services	\$ 23.5	\$ 22.2
Management and General	20.0	16.3
Total Expenses	\$ 43.5	\$ 38.5
Change in Net Assets	\$ (1.2)	
Prior Period Adjustment	(2.5)	
Net Change in Net Assets	\$ 3.7	\$ 7.5
Net Assets - End of Year	\$ 124.7	\$ 120.9

ACKNOWLEDGMENTS

Fermilab Friends for Science Education depends entirely on contributions and grants. We thank Fermilab Friends for Science Education members, Tree of Knowledge contributors, and the following organizations for their generous support of Fermilab education programs:

United States Department of Energy

Fermi Research Alliance, LLC

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Batavia High School

Geneva High School

Kane County Astronomical Society

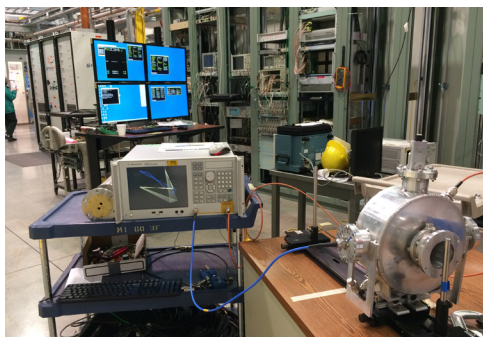
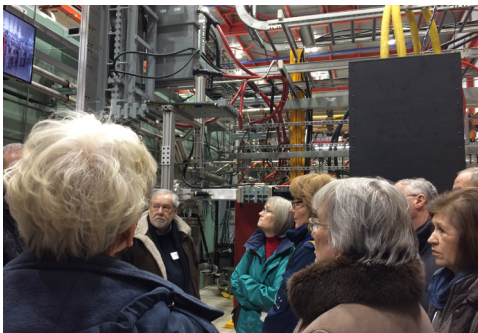
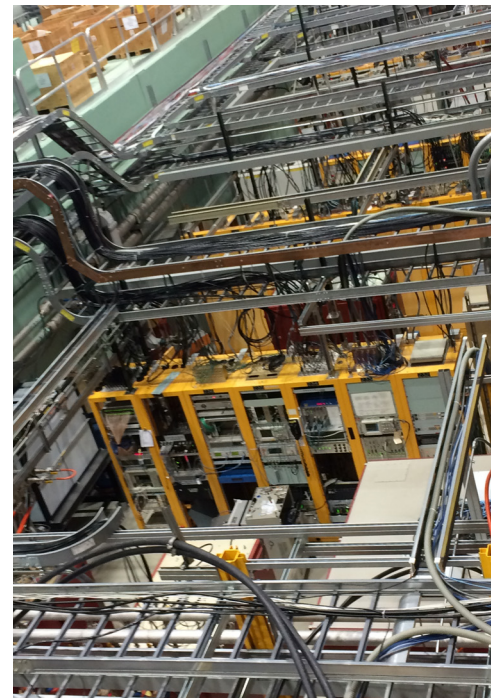
Invent Now, Inc.

Village of Montgomery

Yorkville High School

MEMBERS ONLY TOUR

Members of FFSE had the unique opportunity on December 10, 2016, to tour to the Fermilab Accelerator Science and Technology (FAST) Facility and Integrable Optics Test Accelerator (IOTA) storage ring. The mission of these areas is to develop a fully-equipped test facility to support research and development of accelerator technology for the next generation of particle accelerators.



Members' tours are offered yearly and focus upon not only the work at Fermilab, but also the global community that strives to build upon a relevant and fascinating knowledge base.

HELEN EDWARDS

Mother of the Tevatron

May 27, 1936 – June 21, 2016



On December 10, 2016, a plaque was dedicated in memory of Dr. Helen Edwards, the mother of the Tevatron.

Known as the "Architect of the Tevatron,"

Dr. Edwards is remembered for her scientific accomplishments and giving spirit.

FFSE commemorated this remarkable woman by engaging children and other visitors with the Race for Energy outdoor exhibit (miniature Tevatron).

